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BITTERBRUSH NUTRITION LEVELS UNDER NATURAL AND THINNED PONDEROSA PINE

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INTRODUCTION

Game and land managers have long wondered why deer generally prefer food in openings or along edges instead of under a heavy timber overstory. Is their preference due to a single overriding factor or a combination of factors?

This study was conducted in mid-September, 1963, to determine nutritional differences in antelope bitterbrush *(Purshia tridentata)*[1/] as influenced by different ponderosa pine *(Pinus ponderosa)* stocking levels.

We felt this information, in turn, might give us a lead to further research which would help solve the riddle of deer feeding habits. Since 1960, approximately 130,000 acres of National Forest ponderosa pine stands have been thinned in the Northwest. An understanding of the effect of thinning on forage nutrition may aid in the proper manipulation of deer habitat.

1/ Authorities for common and scientific names are:

Shrubs, forbs, and grasslike plants--Kelsey, Harlan P., and Dayton, William A. Standardized plant names. 675 pp. New York: J. Horace McFarland Co. 1942.

Trees--Little, Elbert L., Jr. Checklist of native and naturalized trees of the United States (including Alaska). U.S. Dep. Agr. Handb. 41, 472 pp. 1953.

Grasses--Hitchcock, A. S. Manual of the grasses of the United States. U.S. Dep. Agr. Misc. Pub. 200 (rev.), 1051 pp., illus. 1951.

STUDY AREA

The work was done in central Oregon on the Pringle Falls Experimental Forest at an elevation of 4,400 feet. Precipitation averages 24 inches annually, much of it occurring as rain. The average annual winter snowpack is approximately 24 inches deep.

The area, with old-growth ponderosa pine, averaged a site IV[2/] and had reproduction of 1- to 5-inch d.b.h. as dense as 20,000 stems per acre. The shrub, grass, and forb understory crown cover averages 83, 1, and 16 percent, respectively. Primary understory species are listed as follows:

Shrubs

Antelope bitterbrush *(Purshia tridentata)*
Snowbrush ceanothus *(Ceanothus velutinus)*
Pine manzanita *(Arctostaphylos parryana* var. *pinetorum)*

Grasses and Grasslike Plants

Western needlegrass *(Stipa occidentalis)*
Ross sedge *(Carex rossi)*
Squirreltail *(Sitanion hystrix)*

Forbs

Virginia strawberry *(Fragaria virginiana)*
Spreading dogbane *(Apocynum androsaemifolium)*
Common yarrow *(Achillea millefolium)*
Penstemon *(Penstemon* spp.*)*

The study site is in the upper edge of the ponderosa pine /antelope bitterbrush/western needlegrass plant association where it grades into ponderosa pine/snowbrush ceanothus/western needlegrass.

The soil, a Regosol developed from dacite pumice, is classified as the Lapine series. This pumice was deposited approximately 7,300 years ago during an eruption of Mount Mazama. Depth averages 33 inches. The pumice soil is underlain by a sandy loam Paleosol developed in older volcanic ash. The Lapine series typically has a thin litter layer; a 2-inch-thick A_1 horizon of dark grayish-brown loamy coarse

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2/ Meyer, Walter H. Yield of even-aged stands of ponderosa pine. U.S. Dep. Agr. Tech. Bull. 630, 60 pp., illus. 1938.

sand; an AC horizon, 8 to 14 inches thick, containing some coarse pumice fragments; a C_1 horizon, 4 to 8 inches thick, of fine and medium pumice gravel; and a light-grey C_2 horizon, 6 to 10 inches thick, of fine pumice gravel.[3/]

PROCEDURES

Plots used in this study make up a small portion of a study in tree spacing which was designed and installed for timber management research.[4/]

The mature overstory was completely removed from a portion of the pine stand in order to apply thinning treatments to the reproduction. Spacings used in this study were 13.2 feet and 26.4 feet and had been in place four growing seasons prior to sample collection.

Twenty-seven bitterbrush samples were collected for analysis; three in each of three plots under natural pine stands and 13.2- and 26.4-foot spacing treatments. Each sample included only current-year leader material from at least five different plants. An analysis, using procedures outlined by the Association of Official Agricultural Chemists,[5/] was made on samples, revealing data on percent crude fiber, ash (primarily mineral salts), crude fat, crude protein, and N.F.E. (nitrogen free extract). All analyses were made on ovendry material.

Effects of tree thinning on each of five nutrient groups, in terms of nutrient percentages, were compared in an F test of significance at the 0.05 level of probability (table 1).

Estimates of basal area of the pine were used for comparing treatments.

RESULTS

Results of the chemical analyses are shown in table 1. Analysis of bitterbrush revealed a significantly higher percent ash and N.F.E.

[3/] Barrett, James W., and Youngberg, C. T. Effect of tree spacing and understory vegetation on water use in a pumice soil. Soil Sci. Soc. Amer. Proc. 29: 472-475, illus. 1965.

[4/] Barrett, James W. Spacing and understory vegetation affect growth of ponderosa pine saplings. Pacific Northwest Forest & Range Exp. Sta., U.S. Forest Serv. Res. Note PNW-27, 6 pp., illus. 1965.

[5/] Association of Official Agricultural Chemists. Official methods of analysis. Ed. 9, edited by W. Horwitz. 832 pp. Washington, D.C. 1960.

Table 1.--Average percentage of five nutrient groups in bitterbrush under two thinning levels of ponderosa pine saplings and a natural mature stand with thick sapling reproduction

Nutrient groups	Natural stands	Thinned saplings	
		13.2-foot spacings	26.4-foot spacings
N. F. E.[1/]	50.31*	47.69	46.98
Crude protein	9.76	9.40	9.40
Crude fat	5.80	4.90	4.96
Crude fiber	21.64*	27.21	26.90
Ash	4.20*	3.05	3.11

* Significant at 0.05 level of probability.

[1/] Nitrogen free extract.

and lower percent crude fiber content under the natural stand of pine than under the thinned stands. There appeared to be a consistently higher level of crude fat under the natural stand as compared with the thinned stands, although the differences were not significant. There were no significant differences in nutrient groups between thinning treatments.

Tree basal area values for the natural stand and 13.2- and 26.4-foot spacings were 127.5, 12.5, and 3.8 square feet, respectively.

In order to show relationships more clearly, data for tree basal area, crude fiber, ash, and N.F.E. are compared graphically in figure 1. Crude fiber increased and ash and N.F.E. content decreased with a decrease in tree basal area.

DISCUSSION

Bitterbrush samples were taken for analysis in mid-September as the plants approached their fall-winter dormancy. Sampling at this stage minimized any differences in nutrient content between sites

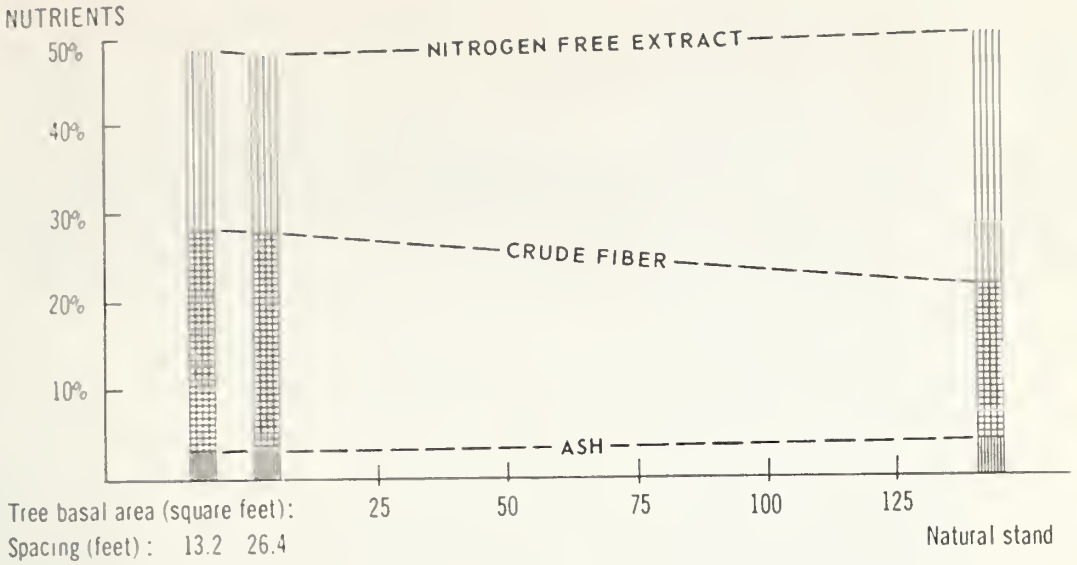

Figure 1.--Changes in crude fiber, N.F.E. (nitrogen free extract), and ash content of bitterbrush in relation to changes in ponderosa pine basal area.

resulting from different seasonal growth stages. Soil moisture analysis[6] showed all available moisture was used by mid-September in the natural stand of pine and 80 percent used in the thinned stands.

In general, plants grown in the shade are more succulent and thus would be expected to have less fiber than those grown in the sun. Because of their succulence, it would seem reasonable to assume they might be preferred by deer over their more fibrous neighbors, although observations of deer feeding habits do not support this assumption.

Crude protein content of bitterbrush did not vary significantly in this study between the shady, natural pine stand and the more sunny, thinned stands. However, at least two observers, Dealy[7] and Einarsen,[8]

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[6] See footnote 3.

[7] Dealy, J. Edward. The influence of logging practices on Columbian black-tailed deer (*Odocoileus hemionus columbianus* Richardson) in the Blue River area of Oregon. 1959. (Unpublished master's thesis on file at Oreg. State Univ., Corvallis.)

[8] Einarsen, Arthur S. Crude protein determination of deer food as an applied management technique. N.Amer. Wildlife Conf. Trans. 1946: 309-312.

have reported higher protein in shrubby material from open areas, and there has been some speculation that deer can detect and actually seek those plants with a higher food value.

Perhaps the ash, which is significantly higher in material from the natural stand, contains some mineral component that is distasteful to a deer. There are many unanswered questions that will best be resolved only by fundamental studies that delve into the basis for food selection by ruminants. Such studies are now in the planning stage.